CLAIMS

1. A vibration-type paper cutting machine, comprising:

a table for placing thereon stacked plural paper sheets;

a cutter blade having blade edge at an upper end parallel to a paper-placed surface of the table, and being placed beneath the table;

a paper holder that freely moves up and down to move downward for pressing down the stacked paper sheets;

a vertical guide for sandwiching the paper holder in a vertical direction to freely slide up and down in contact therewith;

a first motor for driving the paper holder;

a first screw to be rotated by the first motor;

a first nut screwed to the first screw;

a link for coupling the first nut with the paper holder;

a pair of guides each having a diagonally-extending guide groove, and sandwiching the cutter blade in the guide groove to freely slide in contact therewith;

a slider protruding from the cutter blade vertically to a surface of the cutter blade to engage with the guide groove; and

a mechanism for vibrating the slider at a low frequency in a direction along the guide groove;

whereby the cutter blade is allowed to move up and down while vibrating at the low frequency in the direction along the guide groove.

2. The vibration-type paper cutting machine according to claim 1, wherein

the slider is configured by engaging with and coupling to a vertical groove that is formed to a moving element coupled to be a piece with a second nut, which is screwed to a second screw to be rotated by a second motor.

3. The vibration-type paper cutting machine according to claim 2, wherein the mechanism for vibrating at a low frequency is configured by a gear mechanism for changing a rotation speed of the second screw.

4. The vibration-type paper cutting machine according to claim 3, wherein

the gear mechanism for changing the rotation speed of the second screw

includes a pair of eccentric gears.

5. The vibration-type paper cutting machine according to claim 4, wherein an angular speed change ω_2/ω_1 of the eccentric gears, a speed change V, and a center distance a_1+a_2 are expressed by an expression below;

Angular Speed Change: $\omega_2/\omega_1 = (1 + \varepsilon)/(1 - \varepsilon) \sim (1 - \varepsilon)/(1 + \varepsilon)$

Speed Change: $V = 2\pi fr\ (1 \pm 2\delta/r)$

Center Distance: $a_1 + a_2 = 2r \sim 2r+\delta^2/r$

Herein, $\varepsilon = 2\delta/(a_1 + a_2) \cong \delta/r$

where δ: an eccentric volume of the eccentric gears

f: a rotation speed of the eccentric gears

a_1: a radius of an eccentric gear 23a

a_2: a radius of an eccentric gear 23b.

6. The vibration-type paper cutting machine according to claim 1, further comprising

a cutter base for moving up and down in response to vertical motion of the cutter blade while being in surface contact with the cutter blade, wherein

a first stopper piece is attached at both ends of the paper holder,

a second stopper piece is attached at both upper ends of the cutter base, and

when the cutter blade moves up and reaches at a predetermined position, the first and second stopper pieces abut each other.

7. The vibration-type paper cutting machine according to claim 6, wherein

one side of the first stopper pieces and the second stopper pieces is configured as a screw mechanism, thereby enabling a blade edge of the cutter blade to be adjusted in position when the stopper pieces abut thereto.